

## ECOLOGICAL AND FAUNISTIC NOTES ON A COLLECTION OF ORTHOPTERA FROM SOUTH KOREA<sup>1</sup>

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### INTRODUCTION

Published reports of Korean Orthoptera are not numerous in the literature. Ikonnikov (1913) presented comments and species descriptions on a collection of Acrididae made by P. Schmidt from many localities throughout the country. Bey-Bienko (1931) published a short paper discussing fifteen species of Tettigoniidae and Acrididae collected in North Korea. Mori (1933) published, in Korean, a more comprehensive, though now incomplete, treatise on the Korean Tettigoniidae. The most recent account dealing with the Korean fauna is that of Tsyplenkov (1970) which discusses the grasshoppers (Acridoidea) of North Korea. He commented on the climate, topography, and vegetation of the Korean peninsula and the incomplete nature of the state of knowledge of the Orthoptera of the two countries. His study, involving only twenty-one species in twenty genera, indicates that the grasshoppers are primarily derivatives of the Sino-Japanese fauna. These are the major works on Korean Orthoptera. Other studies, such as generic revisions and broader faunistic surveys, have included Korean material and reference to many of these publications will be found throughout this paper.

We present a report based on a collection made by the second author while stationed at a U. S. Airforce Operating Location post at Palgong San, South Korea (figs. 1-2) during the summer and fall of

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FIG. 1. Palgong San Mountain. Note rice paddy in foreground.

1968. Palgong San is located approximately 10 miles northeast of Taegu, capitol of Yeongcheon province. The small village of Taeguedong is situated on its lower slopes but the U. S. airforce installation is the sole occupant of the crest of the mountain. Palgong San mountain is a prominent feature of the landscape (fig. 1) and ascends to an elevation of nearly 4,000 feet. The lower slopes have been extensively cleared and terraced by the natives for rice and other field crops. Wood gathering has significantly decimated the upper slopes of the mountain.

The vegetation of the mountain consists of mixed conifer and deciduous forest with more conifers near the crest. The area receives snow from late October through early April and over 25 inches of rain during the summer. The geological substrate of the mountain is primarily granite. Our collection was made at basically two different localities on Palgong San. One (foreground of fig. 1) is along the margins of a cultivated rice paddy, elevation approximately 2,500 feet. The other is in the vicinity of the crest of the mountain, elevation approximately 4,000 feet. Other areas sampled on the mountain are indicated in the text under different elevations.



FIG. 2. Map of Korea.

## Family Pyrgomorphidae

*Atractomorpha lata* (Motschoulsky)

1866. *Truxalis lata* Motschoulsky, Catal. Insectes recus du Japon. Byull. Mosk. Obshch. Prir. 39:181.
1871. *Perena concolor* Walker, Cat. Derm. Orth. in British Mus., 3:506 (in part).
1874. *Minorissa alata* Thomas, Descriptions of some new Orth. and notes of some species but little known. Bull. United States Geol. Geogr. surv. Terr., 1(2 ser. 1):63.
1884. *Atractomorpha Bedeli* Bolivar, Monografia de los Pirgomorfinos, An. Soc. España Hist. Nat., 13:66,69.
1951. *Atractomorpha heteroptera* Bey-Bienko, Pedsemeistvo Pyrgomorphinae. In Bey-Bienko and Mistchenko, L. L. Saranchevye Fauna SSSR i sopredel' nykh Stron. Chast'I Opred. Fauna SSSR 38:275.
1970. *Atractomorpha brevicornis heteromorpha*, Tsyplenkov, Ent. Rev., 49(2):214.

Record.—Korea, 50 mi. S. Seoul, Osan airforce base, 23-X-1968 (G. R. Miller, 1♀).

Discussion.—This species is rather broadly distributed in North Korea as suggested by the records of Tsyplenkov (1970) who recorded it from North Korea for the first time. It will probably be found to be similarly widespread in the south as well.

## Family Acrididae

## 1. Subfamily Catantopinae

*Anapodisma* Dovnar-Zapol'skii

1933. *Anapodisma* Dovnar-Zapol'skii, Trud. Zool. Inst. :253:

This genus was proposed to include a single species recorded from the southern portion of the Maritime Territory. Ikonnikov (1913) recorded it under the name *Podisma dairisama* Scudder from several localities in Korea. His series consisted of females and a single male and he was doubtful of the placement of the specimens from Korea in that

species. It is apparent that the species described below is the one he referred to in his discussion.

Generic diagnosis:

1. Tegmina short, shorter than dorsal length of pronotum.
2. Median carina of pronotum weak but distinct.
3. Tympanic organ present on first abdominal segment.
4. Hind tibia without apical spur on outer margin of dorsal surface.
5. Hind femur with smooth dorsal carina.
6. Pronotum with lateral carinae indicated solely by color.
7. Prozona elongate, 2.50-2.70 times longer than metazona.
8. Apex of pronotum with a medial notch.
9. Subgenital plate of male conical.
10. Ovipositor of female with two denticles at apex.

*Type of the genus: Anapodisma miramae* Dovnar-Zapol'skii 1933 by monotypy.

### *Anapodisma beybienkoi* Rentz and Miller NEW SPECIES

(Figs. 3-8)

*Diagnosis.* Tegmen covering tympanal organ. Furcula of male cylindrical, parallel; lateral processes of supra-anal plate elongate, slender; cercus elongate, equal in length to basal width of subgenital plate; apical projection of subgenital plate elongate. Female with mesosternal interspace twice as broad as long; supra-anal plate broad, without any indication of longitudinal sulcus; ovipositor with dorsal ridges parallel, with low serrations; subgenital plate produced mesad.

*Description.* HOLOTYPE MALE. HEAD short, dorso-ventral length slightly longer than dorsal length of pronotum; frons in profile distinctly sloped; frontal ridge with distinct furrow, better indicated in dorsal 2/3, approaching but not attaining clypeus, in profile projecting beyond base of antennae. Vertex broadly triangular, depressed mesad, without median carinae; fastigium slightly less than twice as broad as interocular distance at vertex; foveolae obsolete. Antennae extending distad beyond apex of pronotum. PRONOTUM elongate not convex in profile; prozona smooth, metazona rugulose, dorsal sur-



FIG. 3. Habitat of *Anapodisma beybienkoi* Rentz and Miller, new species.

face with three transverse sulci (fig. 4); median carina weak, obsolete between sulci, more distinct on metazona; lateral lobes trapezoidal, longer than deep, posterior portion (part of metazona) coarsely punctate; anterior margin of dorsal surface weakly rounded, median carina feebly emarginate; posterior margin of dorsal surface concave, emarginate; anterior and posterior lateral angles obtuse; ventral margin truncate in distal 1/2, anterior portion truncate but directed dorsad. TEGMINA abbreviate, elongate, with three prominent longitudinal veins, attaining apex of first abdominal segment, covering 2/3 of abdominal tympanum. LEGS. Fore femur stout, convex dorsad, ventral margin distinctly concave. Fore and middle tibia bowed, ventral surface convex; anterior and posterior margins of ventral surface with three spines in apical 1/4, two longer spines at apex. Middle femur thickened, outer surface without any indication of lateral longitudinal sulcus. Hind femur elongate, little more than 4.30 times longer than basal width; ventral genicular lobe short, with apex broadly rounded, ventral margin weakly sinuous; dorsal surface with eleven pines on inner



margin, ten on outer margin, all equally spaced, weakly recurved. Apex of ventral surface with two spurs on inner margin of equal length. Empodium between claws large, ovoid, not attaining apex; first segment of hind tarsus subequal to third. Prosternum with prominent, conical, tubercle weakly directed toward mesosternum. Mesosternal lobes widely separated, length of lobe almost equal to its greatest width, interspace with lateral margin convex, nearly  $3/4$  as wide as mesosternal lobe. Metasternum with lobes feebly separated, interspace narrow, somewhat expanded anteriorad, greatest width  $1/3-1/4$  that of mesosternal interspace at anterior margin. ABDOMEN smooth, almost glabrous, without punctation; median carina feebly indicated, especially in posterior portion of segments. Tympanal organ of first tergite well developed, open; furculae of distal tergite small, cylindrical, rugulose and finely punctate; supra-anal plate triangular, almost as broad as long (fig. 5); dorsal surface on each side with prominent tubercle; lateral margins and tubercles finely punctate. Cercus conical, distal  $1/4$  narrowed dorso-ventrally flattened, in length just attaining apex of supra-anal plate. Subgenital plate with prominent apical tubercle and apparent second tubercle formed by pallium directed dorsad at apex of supra-anal plate. Concealed genital complex (figs. 7-8).

*Allotype female.* Similar to male but with following exceptions: size larger, form more robust. Mesosternal interspace nearly twice as broad as long. Supra-anal plate triangular, nearly as wide as long, without any indication of median longitudinal sulcus. Cercus stout, 2.5 times longer than basal width, tapered to apex. Ovipositor (fig. 6) elongate, ridges of dorsal valves parallel, with low, blunt serrations; apex of dorsal and ventral valves excavate, dentate. Subgenital plate simple, produced mesad.

*Coloration.* Overall coloration of species in life uniform in series before us, dark olive green except for following areas, eye reddish brown; head distad of eye dorsally with black stripe extending adjacent onto pronotum and continuing laterally to pronotal apex. Tegmen pink, veins concolorous. Dorsum of femora, tarsal claw and empodium brownish. Supra-anal plate and furecula of male black except for medial longitudinal portion. Cercus green, apical  $1/2$  dark brown to black. Supra-anal plate of female concolorous with rest of abdomen; cercus light brown; ovipositor straw brown to pink.

## Measurements.—

	Total length	Length Pronotum	Width Pronotum	Length Hind Femur
<i>Males</i>				
holotype	21.50	4.30	2.70	10.80
paratypes	18.10-18.40	4.00	2.80	10.10-10.30
<i>Females</i>				
allotype	22.50	4.80	4.00	12.30
paratypes	23.20-26.40	4.80-5.40	3.90-4.50	12.80-13.40

Records.—Korea, Palgong San, crest of mountain, 4,000 ft. elev., 14-VII, 21-VII-1968 (holotype, allotype), 5-VIII, 10-VIII, 25-VIII-1968 (G. R. Miller, 9♂♂, 18♀♀).

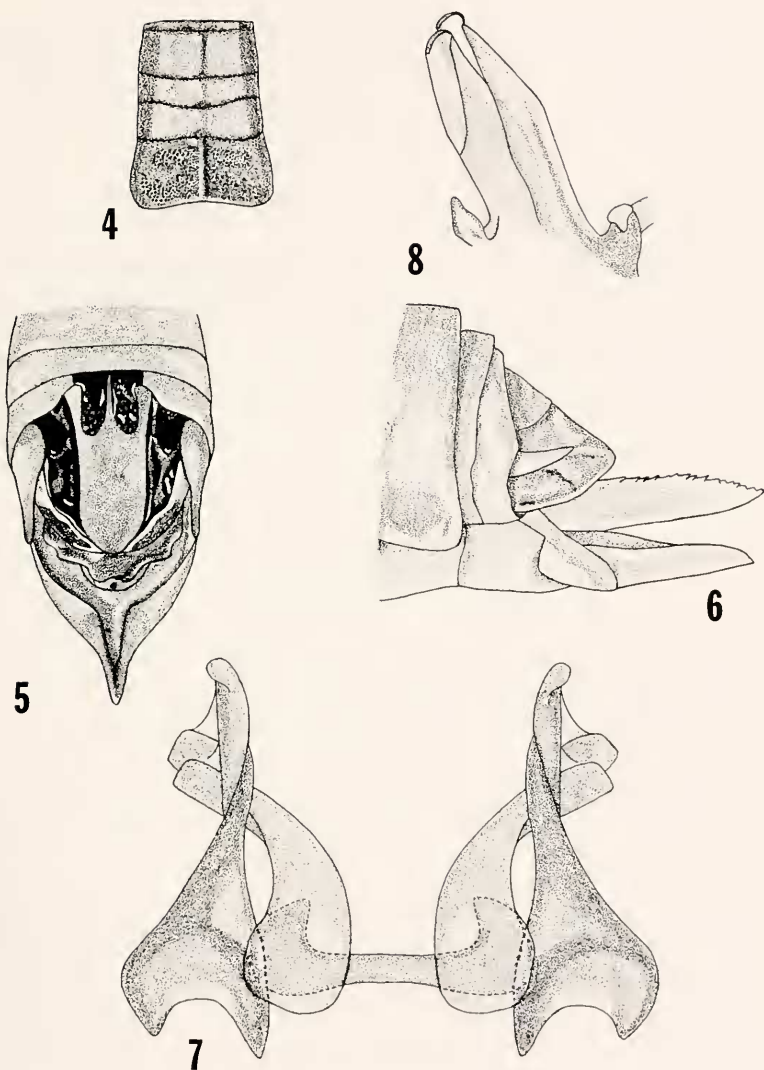
*Deposition of type.* The holotype and allotype are deposited in the Academy of Natural Sciences of Philadelphia. Paratypes will be deposited in the U. S. National Museum, British Museum (Natural History), University of Michigan (Museum of Zoology), and the Zoological Institute of the USSR.

*Derivation of name.* We take pleasure in christening this species in honor of Dr. G. Y. Bey-Bienko of the Zoological Institute of the USSR who kindly contributed comparative notes with *A. miramae* the only other known member of the genus and aided with the identification of several other species reported in this paper.

*Discussion.* *Anapodisma beybienkoi* is one of the commonest grasshoppers occurring near the crest of Palgong San. It prefers exposed granitic outcrops with sparse vegetation. The olive green coloration of the grasshoppers with their pink wings renders them quite obvious against their background. Copulating pairs as, well as ovipositing females, were frequently encountered.

The University of Michigan collection contains two males and two females of an *Anapodisma* collected in the Central National Forest, 18 miles northeast of Seoul on 11 July, 14 August, and 22 August 1954 by G. W. Byers which probably represents a third species. Only a single specimen (male) has the tegmina attaining the tympanum, the others have the condition illustrated by *A. miramae*. In addition, the rugosity of the posterior portion of the pronotum is reduced and the teeth of the ventral ovipositor valves of the females are more pronounced. The cercus of the male is more stout and shorter than the basal width





FIGS. 4-8. *Anapodisma beybienkoi* Rentz and Miller, new species. Fig. 4 pronotum fig. 5 abdomen holotype male. Fig. 6 apex of abdomen allotype female. Figs. 7,8 concealed genitalia holotype male, all greatly magnified.

of the adjacent subgenital plate. In addition, the apical tubercle is less pronounced. The dry aedeagus is much as illustrated by *A. beybienkoi*.

***Oxya sinuosa* Mistshenko**

1951. *Oxya sinuosa* Mistshenko, I zdatel'stvo Akad. Nauk SSR, Mosc. p. 167.

*Records.* Korea, Palgong San, 10 airline mi. N., in rice paddies, 2-X-1968 (G. R. Miller, 6♂♂, 10♀♀).

*Discussion.* Although described from the region of Seoul, Korea, *O. sinuosa* is widespread throughout the country and reports of *O. velox* in that country likely refer to this species, Bey-Bienko and Mistshenko (1951). Tsyplenkov (1970) listed many localities in North Korea for this species. *Oxya* species have long been pests in rice paddies and *O. sinuosa* is no exception. The species is abundant in the paddies at the base of Palgong San where it causes considerable damage.

## 2. Subfamily Acridinae (sensu latu)

***Acrida cinerea* Thunberg**

1815. *Truxalis cinereus* Thunberg, Mem. Acad. St. Petersb., 5:263.

1815. *Truxalis unicolor* Thunberg, ibid.:263.

1842. *Truxalis chinensis* Westwood, Donovan Ins. China, 22, pl. 10.

1866. *Acrida lata* Motschoulsky, Bull. Sci. Nat. Mosc., 39(1):181.

1901. *Acrida csikii* I. Bolivar, 3-tes Asiat. Forschungreise, 2:228.

1913. *Acrida turrita koreana* Ikonnikov Uber Schmidt aus Korea mitgebr. Acridiodeen, Kuznetzk:10.

*Records.* Korea, Palgong San, 10 airline mi. N. Taegu, in rice paddies at base of mountain, 22-VII-1968 (5♂♂, 2♀♀ all last instars), 23, 25-VIII, 2-X-1968 (G. R. Miller, 5♂♂, 4♀♀).

*Discussion.* The interesting taxonomic history of *A. cinerea* is a manifestation of its many chromatotypes and morphotypes. Variation in body size is probably the biggest factor attributing to the above synonymy. The species is widespread, Dirsh (1954) listing it from Japan, Kyushu, Korea, Manchuria, Mongolia, China, Macau, and Formosa. Its closest relative is *A. testacea* from South Africa. The species is quite common in the rice paddy areas at the base of the mountain where they are avidly collected by the Koreans who strip the legs from the grasshoppers and roast them. Large wicker baskets of

roasted grasshoppers, primarily of this species, are common sights in the market places near Taegu.

### *Arcyptera coreana* Shiraki

1930. *Arcyptera coreana* Shiraki, Trans. Nat. Hist. Soc. Formosa, 20(111):328.

Records.—Korea, Palgong San, mid point between base and crest, 27-VII-1968 (G. R. Miller, 3♂♂, 1♀).

Discussion.—This species is known from northeastern China, Manchuria, Hupei and Kiangsu. It is a widespread species in North Korea as suggested by the records of Tsyplenkov (1970) and is pestiferous and abundant in rice and other grain crops.

### *Chorthippus* (*Megaulacobothrus*) *aethalinus aethalinus* Zubovskii

1899. *Stenobothrus aethalinus* Zubovskii, Trud. Russ. ent. obsch., 32:600.

1898. *Stenobothrus fuliginosus* Zubovskii (not of Ivanov), Ezhe, Zool. Mus., Acad. Nauk, 3:87.

Records. Korea, Palgong San, 8 airline miles N. Taegu, 4,000 ft. elev., 4-VII, 27-VIII, 3-VIII, 10-VIII-1968 (G. R. Miller, 14♂♂, 12♀♀).

Discussion. Bey-Bienko and Mistshenko (1951) stated that this subspecies ranges from southern Siberia from the Altai to the lower course of the Amur, Northern Maritime Territory; north China and Manchuria. Bey-Bienko (personal communication) suggests that the subspecies *C. a. koreanus* Mistshenko from eastern Korea and *C. a. kongausensis* (Caudell) from the southern part of the Maritime Territory may actually all be synonymous with *C. a. aethalinus*, the purported differences attributeable to variation. Tsyplenkov (1970) recorded *C. a. koreanus* from Wonsan Mountain Pass. Singing males were observed repeatedly on the bare gravelly areas near the top of Palgong San Mountain (fig. 3).

### *Chorthippus* (*Glyptobothrus*) *biguttulus maritimus* Mistshenko

1951. *Chorthippus biguttulus maritimus* Mistshenko, Fauna USSR, Zool. Inst. USSR, no. 40, Engl. Trans.

Records.—Korea, Palgong San, 8 airline miles N. Taegu, 4,000 ft. elev., 5-VIII, 10-VIII, 24-VIII-1968 (G. R. Miller, 10 ♂ ♂, 7 ♀ ♀).

*Discussion.* Bey-Bienko and Mistshenko (1951) listed many localities for this subspecies in the Maritime Provinces and adjacent islands. They noted "evidently Korea and Japan," Tsyplenkov (1970) recorded the subspecies from Wonsan Mountain Pass in North Korea and we verify its occurrence in South Korea. This grasshopper is quite common on Palgong San Mountain where the red-legged males may be observed courting females on sparsely vegetated ground.

### *Mongolotettix japonicus japonicus* (I. Bol.)

1898. *Chrysochraon japonicus*, I. Bolivar, Ann. Mus. An. Stor. Nat. Genova, 39:82.

1932. *Mongolotettix japonicus japonicus*, Bey-Bienko, Eos, 8:83.

*Records.* Korea, Palgong San, 8 airline mi. N. Taegu, VI-6, VI-10, 14-VII, 27-VII, 10-VIII-1968 (G. R. Miller, 4 ♂ ♂, 8 ♀ ♀).

*Discussion.* This subspecies is known from the Maritime Territory, throughout Korea and Japan. It was common on Palgong San Mountain, especially at the crest in wooded thickets.

### 3. Subfamily Oedipodinae

#### *Bryodema tuberculatum dilutum* (Stroll)

1813. *Gryllus tuberculatum* Fabricius, Sept. Ent., p. 290.

1813. *Bryodema tuberculatum dilutum* Stroll, Repres. Spectres, p. 21.

1838. *Oedipoda tuberculata*, Burmeister, Handb. Ent., p. 641.

1882. *Bryodema tuberculata*, Brunner, Prodr. Eur. Orth., p. 167.

1913. *Bryodema tuberculatum siberica* Ikonnikov, Uber. die von P. Schmidt-Aus Korea Mitgebr. Acrid, p. 17.

*Records.* Korea, Palgong San, 4,000 ft. elev., 27-VII-1968 (G. R. Miller, 6 ♂ ♂, 2 ♀ ♀).

Tsyplenkov (1970) was the first to record this subspecies from the Korean Peninsula. It is broadly distributed over the European part of the USSR and Ural region, Siberia, Mongolia, and China from Peking to Kansu and Szechwan province and from Tibet to the Hima-

layas. It probably occurs throughout Korea in suitable habitats. Our specimens were collected on exposed granitic outcrops where the loudly studulating males were to be found after the long courtship flights. In this respect, the species is similar to *Circotettix* and *Aer choreutes* of North America. The coloration of the grasshoppers is basically tan with grey and black speckles and blotches. This renders the grasshoppers almost complete camouflage on the granitic rock. The red hind wing and black band are readily seen, however, when the grasshoppers fly high in the air during courtship.

### *Oedaleus infernalis infernalis* Saussure

1884. *Oedaleus infernalis* Saussure, Mem. Soc. Phys. Geneve, 28(9):117.

Records.—Korea, Palgong San, 4,000 ft. elev. 8 airline mi. N. Taegu, 27-VII, 23-VIII-1968 (G. R. Miller, 4 ♂♂, 2 ♀♀).

*Discussion.* *O. infernalis* has been subdivided into a number of subspecies, all of which have been implicated in destroying cultivated plants especially rice. In the Palgong San region the grasshopper was found mostly on the slopes of the mountain and not in the rice paddies where considerable damage was being done by other grasshopper pests, *Oxya sinuosa* and *Acrida cinerea*. *O. i. infernalis* is known from northeastern China, Taiwan, Japan and the Ryuku Islands. Tsyplenkov (1970) recorded it from many localities in North Korea where it was often associated with rice.

### *Trilophidia japonica* Saussure

1888. *Trilophidia japonica*, Mem. Soc. Phys. Geneve, Add. ad Prod. Oedip., 30(1):54.

*Record.* Korea, Palgong San, 4,000 ft. elev., 24-VIII-1968 (G. R. Miller, 1 ♂).

*Discussion.* This genus is composed of three species, two occurring in Java, and *T. japonica* known from North China, Manchuria and Japan. Tsyplenkov (1970) recorded the species from Korea for the first time, listing Sariwon and Pyongyang as localities. His notations indicate the species was found in rice paddies but our single specimen was found near the crest of the mountain where rice is not grown.

## Family Tettigoniidae

## 1. Subfamily Tettigoniinae

*Tettigonia dolichoptera* Mori

1931. *Tettigonia dolichoptera* Mori, Jour. Chosen Soc. Nat. Hist., 16:52-53, fig. a.

*Records.* Korea, Palgong San, 10 airline miles N. Taegu, base of mountain, in rice paddies, 27-VII, 2-X-1968 (G. R. Miller, 2♂♂).

*Discussion.* Little is known of the habits or geographic distribution of this species which is apparently confined to the Korean peninsula. *T. cantans*, the most widespread representative of the subfamily and much smaller in size also has been recorded from Korea but we have found no specimens near Palgong San. *T. dolichoptera* apparently prefers the lush vegetation bordering the rice paddies and was not found far from water.

## 2. Subfamily Decticinae

*Gampsocleis sedakovi obscura* Walker

1869. *Decticus obscurus* Walker, Cat. Derm. Salt. Brit. Mus. 11, p. 21.  
1906. *Gampsocleis obscurus*, Kirby, Syn. Cat. Orth. 11, p. 185.  
1909. *Gampsocleis christenici* Adelung, Ann. Mus. Zool. Acad. St. Peterb., 14, p. 343.  
1923. *Gampsocleis obscura*, Uvarov, Trans. Ent. Soc. Lond., 3(4):520.

*Records.* Korea, Palgong San, 8 airline miles North of Taegu, 2,500 ft. elev., 27-VII, 25-VIII-1968 (G. R. Miller 7♂♂, 3♀♀).

*Discussion.* Dirsh (1927) synonymized *G. obscura* Walker with *G. sedakovi* (Fischer-Waldeim) and concluded "I consider *G. obscura* (Walker) not a separate species, but only a subspecies of *G. sedakovi* (F.-W.). I came to that conclusion, because in morphological respects I found all transitive degrees between *G. sedakovi* and *G. obscura*." A more thorough study of the geographical distribution of the two is necessary to determine if they should be considered subspecies in the modern sense. *G. obscura* was described from Korea (no definite locality stated) and recorded by Bey-Bienko (1931) from Peikto Mountain, North Korea. Our material agrees well with typical repre-



sentatives of *G. s. obscura*. All specimens were found on the mountain most frequently in sparsely vegetated clearings. This species is a ground dweller.

### **Gampsocleis ussuriensis Adelung**

1910. *Gampsocleis ussuriensis* Adelung, Hor. Soc. Ent. Ross 39:351.  
1918. *Gampsocleis amuriensis* Pylnov, Mem. Inst. Agron. Voronezh., 3:141.  
1918. *Gampsocleis orientalis* Pylnov, loc. cit. p. 142.

*Records.* Korea, Palgong San, 2,500 ft. elev., 25-VIII-1965 (G. R. Miller, 1 ♂).

*Discussion.*—This species is known from Ussuri-land, Kabanovsk and Spassky provinces, Amus and Tchifu China. Mori (1933) was the first to record the species from Korea. Only a single specimen was found on Palgong San where *G. s. obscura* is much more abundant.

### **Metrioptera bonneti (Bolivar)**

1890. *Platypleis bonneti* Bolivar, Ann. Soc. Esp. Hist. Nat., 19:326.  
1926. *Metrioptera bonneti*, Uvarov, Ann. Mag. Nat. Hist., 17:279.

*Records.* Korea, Palgong San, 8 airline miles north of Taegu, 3,500-4,000 ft. elev., 22-V-1968 (3rd and 4th instars), 27-VII, 10-VIII, 23-VII-1968 (G. R. Miller, 7 ♂ ♂, 7 ♀ ♀).

This species was described from Yezo Island near Japan. It is known from several islands near Japan, Uvarov (1926) and Japan itself. Mori (1933) recorded *M. bonneti* from Korea. Our specimens differ from those described by Uvarov (1926) in that the incision of the last abdominal tergite of males is not very deep and the lobes are short and divergent, not acuminate or touching each other as he described. The sixth abdominal sternite of the female does not bear a shallow transverse carina and the lobes of the subgenital plate are considerably shorter in comparison with Japanese specimens of this species.

*M. bonneti* is among the commonest of Orthoptera on the slopes of Palgong San. It prefers herbaceous vegetation when adult but nymphs

are to be found in grassy meadows as well. All of our specimens are dark brown or blackish and only a few nymphs show traces of green, so typical of the material studied by Uvarov. Until types of several species can be studied, it seems advisable not to regard our species as new at this time. On Palgong San, this species is one of the first Orthoptera to appear in the spring.

*Measurements:*

	Total Length	Length Pronotum	Length Hind Femur	Length Ovipositor
Males	16.60-20.00	6.00-6.30	16.10-17.50	
Females	18.30-22.00	6.20-7.00	16.70-18.50	8.50-9.50

**Paratlanlicus palgongensis** Rentz and Miller, NEW SPECIES

(Fig. 9-14)

*Diagnosis.* Closest relative *P. ussuriensis* Uvarov. Male distinctive in following characters: cercus more slender (fig. 9), in *P. ussuriensis* male cercus less than twice as long as basal width; last abdominal tergite with posterior margin produced forming a pair of acute projections; subgenital plate more deeply incised mesad than in *P. ussuriensis*. Titillator (fig. 11). Females are similarly distinctive in the proportionately more slender cerci (fig. 12) pronounced conical tubercle on seventh abdominal tergite, and subgenital plate with a shallow, broadly triangular emargination.

*Description.* HOLOTYPE MALE. Size medium for genus, form attenuate. HEAD with fastigium of vertex,  $3/4$  as broad as diameter of eye, with shallow median sulcus. Eye elongate,  $1\frac{1}{2}$  times as long as greatest width. Occiput feebly convex. Maxillary palpus twice the length of preceeding segment. First antennal segment slightly longer than length of eye, with prominent swelling on dorso-external surface; succeeding segments of antenna missing. PRONOTUM short, disk convex in prozona, distinctly upturned in metazona; anterior  $1/6$  of disk transversed by a shallow, undulant sulcus continuous onto dorsal portion lateral lobes, V-shaped sulcus on median portion of disk indicated almost solely by color. Anterior margin of pronotum weakly

concave, posterior margin truncate to feebly convex. Lateral lobe of pronotum (fig. 10) broader than deep, hind margin without humeral sinus. Prosternal processes elongate, four times as long as basal width. Tegmina longer than length of pronotum. APPENDAGES. Fore tibia armed dorsally with three widely spaced spines on posterior margin, ventral surface with six spines on both surfaces; middle tibia armed dorsally with three spines on anterior margin, four on posterior; ventral surface with six elongate spines on both margins; hind tibia armed dorsally with a great many stout spines on inner and outer margins, ventral surface with fewer, more elongate spines. Apex of hind tibia armed dorsally with a pair of recurved, stout spurs, the external spur subequal to internal; ventral surface with four, stout apical calcei, the internal pair subequal to outermost spur. Plantula of hind tarsus small, quadrate, as long as broad,  $1/3$  or less the length of metatarsus. ABDOMEN without carinae; tergite 10 with deep V-shaped medial incision forming a pair of acute projections. Cereus dorso-ventrally flattened (fig. 9) internal tooth blunt, distal tooth hooked, apex sharp. Subgenital plate with a broad V-shaped medial incision, styles very elongate, longer than apical width of plate between the styles. Titillators (fig. 11). COLORATION. Generally castaneous brown as usual for the genus. First segment of antenna and portion of head distad of eye heavily marked with black. Face pale testaceous, occiput speckled with grey. Pronotum with disk castaneous, darker at humeral angles and in region of V-shaped marking. Thoracic pleurites with black longitudinal marking continuous onto abdomen. Tegmina castaneous except for apical portion which is much more testaceous brown. Fore and middle legs speckled with black; hind femur with black stripe along entire surface of ventral carina; ventral margin testaceous; base of hind femur black followed by a testaceous or whitish area to middle of dorsal surface. Abdomen castaneous, distal margin of tergites with black spots. Entire dorsal surface of abdomen hirsute, especially in region of tenth tergite.

*Allotype female.* Differs from male in following characteristics: tenth abdominal tergite less deeply incised (fig. 12); cercus conical, distal  $1/4$  abruptly narrowed, apex rather blunt directed inward; subgenital plate broader at apex than base, with a pronounced medial keel, hind margin with a broad V-shaped medial incision; ovipositor shorter than body, decurved. Coloration much as described for male, ovipositor castaneous, apex somewhat darker.

*Measurements:*

	Length of Body	Length Pronotum	Width Pronotum	Length Hind Femur	Length Exposed Tegmen	Length Ovipositor
Males						
holotype	26.50	7.50	5.00	25.20	8.70	
paratype	26.30	7.70	4.30	22.30		
Female						
allotype	31.50	8.60	5.00	26.70	8.50	25.60

*Records.* Korea, Palgong San, 8 airline mi. N. Taegu, 1-IX-1968 (G. R. Miller, holotype male), 14-VIII-1968 (G. R. Miller, 1 last instar ♀), base of Palgong San, 10 mi N. Taegu, 2-X-68 (G. R. Miller, allotype, female in rice).

*Deposition of types.* The holotype and allotype are deposited in the Academy of Natural Sciences of Philadelphia.

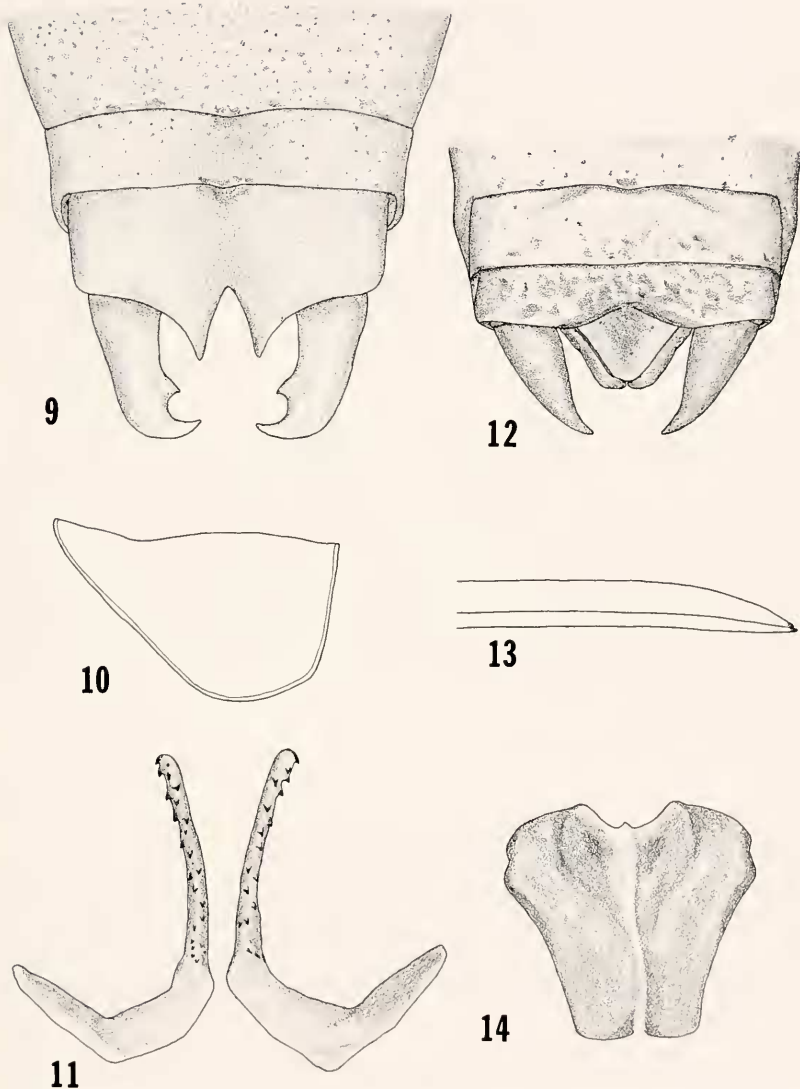
*Derivation of name.* This species is named with reference to the type locality.

*Discussion.* This species is most closely related to *P. ussuriensis* which occurs to the north (Mt. Peikto, Korea) and Spassky, South Ussury region. *P. palgongensis* differs in its larger size and differently shaped genitalia. The species is apparently adapted to both life on the mountain as well as in the lowland rice fields. *P. palgongensis* is a member of the Palpalis Group as delimited by Tinkham (1941). As with *P. ussuriensis*, our species possess a decurved ovipositor, a feature more commonly possessed by the related North American species of the genus *Altanticus*.

3. Subfamily **Phaneropterinae****Kuwayamaea sapporensis** Matsumura and Shiraki

1908. *Kuwayamaea sapporensis* Matsumura and Shiraki, Locustiden Japans. Jour. Agric. Tohou Imper. Univ., 3:8, pl. 2, fig. 11.  
 1913. *Kuwayamaea yezoensis* Matsumura, Thous. Ins. of Japan, Additam, p. 30, pl. 5, fig. 1.

*Records.* Korea, Palgong San, 10 airline mi. N. Taegu, 2-X-1968, in rice paddies (G. R. Miller, 6♂♂, 1 last instar ♀).



FIGS. 9-14. *Paratlanticus palgongensis* Rentz and Miller, new species. Fig. 9 terminalia holotype male, 25X. Fig. 10 lateral view pronotal outline holotype male, 25X. Fig. 11 dorsal view titillators holotype male, 25X. Fig. 12 Terminalia, allotype female, 25X. Fig. 13 apex of ovipositor, allotype female, 15X. Subgenital plate allotype female, 25X.

*Discussion.* Although described from northern Japan, *K. sapporensis* is known from the southern Maritime Territory and Shitokan Island south to the Kuril Islands including Saishu and Hokkaido Islands in northern Japan. Mori (1933) was the first to record the species from Korea where it is common in lowland rice paddies.

In all respect except size, the series recorded here agrees with the comments of Bey-Bienko (1954). Our specimens average larger and are more robust than the five he described, but more material is needed before the nature of this variation can be discussed.

*Measurements:*

	Length	Length	Length
	Pronotum	Tegmen	Hind Femur
Males	4.30-4.60	23.70-26.80	25.30-24.40

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**2.0120 Ecological and faunistic notes on a collection of Orthoptera from South Korea.**

ABSTRACT.—The few reports of Korean Orthoptera indicate that the grasshoppers are primarily derivatives of the Sino-Japanese fauna. Additional studies based on a collection made by the senior author at Palgong San, South Korea add new records and two new species to the known Korean Orthoptera fauna.—DAVID C. RENTZ, Academy of Natural Sciences, Philadelphia, PA 19103 and GLEN R. MILLER, School of Natural Resources, University of Michigan, Ann Arbor, MI 48104.

*Descriptors:* Orthoptera; South Korea; ecology; new species; Pyrgomorphidae; Acrididae; Tettigoniidae.